

67. (Amended) The enhanced electrically erasable programmable element of claim 56, wherein said contact layer comprises [a material selected from the group comprising] at least one of a refractory [metals] metal, a refractory metal [nitrides] nitride, and aluminum.

REMARKS

This Amendment is in response to the Office Action of June 20, 2000, which has been received and reviewed. Claims 1-20 and 32-67 are currently pending in the application, and have each been rejected. Claims 21-31, which were each previously withdrawn from consideration, have been canceled without prejudice or disclaimer. Reconsideration of the application is respectfully requested in light of the amendments and remarks presented herein.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 4, 8, 11, 13, 17, 20, 52, 55, 60, 64, and 67 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, use of the phrase "selected from the group comprising" was objected to. Each of claims 4, 8, 11, 13, 17, 20, 52, 55, 60, 64, and 67 has been amended to remove the language that was seen as objectionable. Accordingly, it is respectfully requested that the section 112, second paragraph rejections of each of claims 4, 8, 11, 13, 17, 20, 52, 55, 60, 64, and 67 be withdrawn.

Rejections Under 35 U.S.C. § 102

Claims 1-11, 32-38, and 56-67 were rejected under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent 5,792,594 to Brown et al. (hereinafter "Brown").

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Brown discloses a method for repatterning semiconductor dice for use in flip-chip applications, as well as various products of the method. The method disclosed in Brown includes forming a first dielectric polymer layer on an active surface of a semiconductor die, exposing bond pads of the semiconductor die through the first dielectric polymer layer, forming a second dielectric polymer layer over the first dielectric polymer layer, and exposing the bond pad and areas of the first dielectric polymer layer upon which circuit traces are to be carried through the second dielectric polymer layer. The first dielectric polymer layer includes a catalyst that facilitates metal plating thereof. The exposed portion of each bond pad and the exposed portions of the first dielectric polymer layer are then plated with a metal, such as copper, that has better conductivity properties and is less corrosive than aluminum. Upon patterning the metal plating, conductive lines and contact pads are formed.

In one described example of the resulting semiconductor die, the new contact pad is formed directly above the corresponding bond pad and is separated therefrom by the two dielectric polymer layers. Brown does not disclose that the formed structure is useful for anything other than to produce a precision interconnecting pattern and terminal bump pattern from metals other than aluminum so as to enhance the performance of a die. Col. 2, lines 46-49 and 55-57.

By way of contrast with Brown, claim 1, as amended and presented herein recites a contact that includes an intermediate conductive layer, an insulator component positioned "so as to at least thermally insulate [an] underlying conductive structure" of the semiconductor device, and an electrically conductive contact layer.

Brown does not disclose a contact with an insulator component positioned so as to thermally insulate an underlying structure of the die. Therefore, it is respectfully submitted that Brown does not anticipate amended claim 1.

Claims 2-11 are each allowable, among other reasons, as depending from claim 1, which should be allowed.

Claim 7 is further allowable since Brown does not disclose a contact with an intermediate conductive layer that includes "a material having a melting temperature that is greater than a temperature required to switch a phase change component in electrical communication with the

contact between a plurality of states.” In fact, Brown does not even mention that the device disclosed therein could include a phase change component.

Claim 9 is also allowable since Brown lacks disclosure of a contact that includes a contact layer with a thickness of about 200 angstroms or less.

Claim 10 is additionally allowable because Brown does not disclose a contact with a contact layer that includes “a material having a melting temperature that is greater than a temperature required to switch a phase change component in electrical communication with the contact between a plurality of states.” In fact, Brown does not even mention that the device disclosed therein could include a phase change component.

Claim 11 is further allowable since Brown includes no disclosure of the use of aluminum, refractory metals, or refractory metal nitrides as the contact layer of a contact. Brown teaches that the repatterned terminals thereof are formed from materials “other than aluminum”. *See, e.g.*, col. 2, lines 55-57.

Independent claim 32, as amended and presented herein, recites, among other things, a contact that includes “a contact layer and an intermediate conductive layer which partially contact one another and substantially envelop an insulator component . . .” The insulator component of the contact is “positioned over an underlying structure of the semiconductor device so as to at least thermally insulate the underlying structure.” It is understood that, as claim 32 is a product-by-process claim, the only limitations considered by the Office in determining patentability are the product limitations.

With respect to the product limitations of claim 32, it is respectfully submitted that Brown lacks disclosure of an insulator component positioned over an underlying structure of a semiconductor device so as to at least thermally insulate the underlying structure. Therefore, Brown does not anticipate every element of amended claim 32.

Claims 33-38 are each allowable, among other reasons, as depending from claim 32, which should be allowed.

Independent claim 56, as amended and presented herein, recites an enhanced electrically erasable programmable element with a contact that includes "an intermediate conductive layer in electrical communication with the electrically erasable programmable element; an insulator component disposed adjacent said intermediate conductive layer and over the electrically erasable programmable element so as to insulate same; and an electrically conductive contact layer adjacent said insulator component."

Brown does not disclose an insulator component that is disposed over an electrically erasable programmable element so as to insulate the same. Thus, it is respectfully submitted that Brown does not anticipate every element of amended claim 56.

Claims 57-67 are each allowable, among other reasons, as depending from claim 56, which should be allowed.

Claim 63 is further allowable since Brown does not disclose a contact with an intermediate conductive layer that includes "a material having a melting temperature that is greater than a temperature required to switch a phase change material of a contacted structure between a plurality of electrical conductivity states." In fact, Brown does not even mention that the device disclosed therein could include a phase change material.

Claim 65 is also allowable since Brown lacks disclosure of a contact that includes a contact layer with a thickness of about 200 angstroms or less.

Claim 66 is additionally allowable because Brown does not disclose a contact with a contact layer that includes "a material having a melting temperature that is greater than a temperature required to switch a phase change material of a contacted structure between a plurality of states." In fact, Brown does not even mention that the device disclosed therein could include such a phase change material.

Claim 67 is further allowable since Brown includes no disclosure of the use of aluminum, refractory metals, or refractory metal nitrides as the contact layer of a contact. Brown teaches that the repatterned terminals thereof are formed from materials "other than aluminum". See, e.g., col. 2, lines 55-57.

For the foregoing reasons, it is respectfully requested that the Office withdraw the 35 U.S.C. § 102 rejections of each of claims 1-11, 32-38, and 56-67.

Rejections Under 35 U.S.C. § 103(a)

Claims 12-20 and 39-55 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brown in view of U.S. Patent 5,296,716 to Ovshinsky et al. (hereinafter "Ovshinsky").

To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure.

The teachings of Brown have been summarized herein.

Ovshinsky teaches an electrically erasable programmable memory (EEPROM) that includes memory elements formed from a phase change material. The phase change material has a plurality of electrical conductivity states, depending upon whether the material is in an amorphous state, a crystalline state, or an intermediate state. The state of the material depends upon the amount of energy (e.g., heat) applied to the memory element. Ovshinsky does not recognize heat loss as a problem or disclose contacts or other structures to at least thermally insulate the phase change memory elements of the EEPROM disclosed therein.

Independent claim 12 recites a contact for a memory element that includes a phase change component. The contact includes, among other things, an intermediate conductive layer in electrical and thermal communication with the phase change component.

Independent claim 39 recites an electrically erasable programmable memory device that includes, among other things, a memory element and a contact. The memory element includes at least one of an electrode and a memory cell that comprises a phase change material. The contact includes, among other things, an intermediate conductive layer in electrical and thermal communication with the phase change material, as well as an insulator component adjacent the intermediate conductive layer.

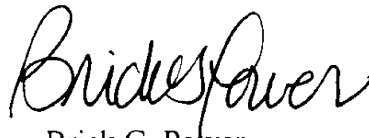
It is respectfully submitted that one of ordinary skill in the art, prior to the time at which the referenced application was filed, would not have been motivated to combine the teachings of Brown and Ovshinsky in the manner that has been set forth in the outstanding Office Action to render obvious the subject matter recited in claims 12-20 and 39-55. Specifically, it is submitted that one of ordinary skill in the art would not have been motivated to combine a contact including an intermediate conductive layer, an insulator component, and a contact layer with a memory element including a phase change material, the intermediate conductive layer of the contact being in electrical and thermal communication with the phase change material, as is recited in both independent claim 12 and independent claim 39.

While FIG. 4 of Brown depicts a conductive terminal positioned above a corresponding bond pad formed from a different conductive material, and the structure has a similar appearance to that shown in the figures of the referenced application, Brown does not provide any suggestion or motivation that the structure illustrated in FIG. 4 would be useful for insulating an underlying phase change structure of a semiconductor device. Ovshinsky, which discloses an EEPROM that includes phase change elements, would also have failed prior to the time at which the referenced application was filed, to have provided any suggestion or motivation to one of ordinary skill in the art to dispose a contact of a type recited in the claims of the referenced application over a phase change element so as to thermally insulate the phase change element. In fact, Ovshinsky does not even recognize a need for thermally insulating the phase change elements of the EEPROM disclosed therein. Moreover, the figures of Ovshinsky do not depict discrete electrical contacts, such as the exposed contacts of Brown, in communication with each memory element, but rather an encapsulated conductive line that connects adjacent memory elements. It is further submitted that the knowledge generally available in the art prior to the time the present application was filed would also have failed to provide one of ordinary skill in the art with any suggestion or motivation to combine the teachings of Brown with the teachings of Ovshinsky.

CONCLUSION

It is respectfully submitted that claims 1-20 and 32-67 are each allowable. An early indication of the allowability of these claims and a notice that the case has been passed for issuance are respectfully solicited. If any issues remain that prevent the allowance of any of claims 1-20 and 32-67 and that might be resolved by way of a telephone conference, the Office is respectfully invited to contact the undersigned at the telephone number provided below.

Respectfully submitted,



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